Business Cycles with Revolutions

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Abstract

This paper develops an empirical macroeconomic framework to analyze the relationship between major political disruptions and business cycles of a country. We combine a new dataset of mass unrests across the world from 1960 to 2006, with macro data (output, investment, trade, inflation and exchange rate). We then build a panel vector-autoregression model with two novel ingredients: (1) mass unrests and (2) an *estimated probability of such unrests*. We find that both terms have statistically and economically significant impacts on business cycles: (1) Periods of mass unrests have an average impact of a moderate rare disaster; (2) More importantly, the estimated probability of mass unrests amplifies and propagates economic and political shocks. The second result suggests that our measure of political risk captures an important source of time-varying uncertainty and volatility in many countries.

Keywords: business cycles, political risk, time-varying uncertainty, panel VAR.
JEL codes: E32; E02

1 Introduction

As this paper is being written, a wave of mass protests is and has been sweeping over many different nations around the world, including Tunisia, Egypt, Greece, Spain,

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Turkey, Brazil, Thailand, Venezuela and Ukraine. In a bigger picture, many nations have experienced episodes of major political disruptions in the past fifty years, including mass unrests that aim to change policies, to change the constitution, or to overthrow ruling regimes. In most of these episodes, political and economic turmoils go hand-in-hand. On the one hand, it is possible that bad economic conditions foment political unrests. For example, it is not a coincidence that the East Asian economic crisis preceded the overthrow of the long-ruling Suharto in Indonesia, or the current global recession that preceded the Arab Spring revolutions. On the other hand, these unrests may disrupt the business cycles, and create periods of high political and economic *uncertainty* that discourage investment and trigger capital outflows. It is thus important to understand the relationship between political unrests and economic fluctuations. This paper explores the two-way relationship between business cycles and political unrests.

Specifically, we ask three questions: (1) Do observable macroeconomic factors, such as a fall in the growth of output, increase the risks of mass political unrests? (2) Do episodes of unrests have (statistically and economically) significant impacts on a nation's business cycles? And most interestingly, (3) does the *risk* of unrests have significant impacts on business cycles?

A brief summary of our answers are as follows: (1) Yes, to an extent; (2) Yes; and (3) Yes, very much so: countries that are more prone to political unrests experience business cycles that are significantly different from those countries that are not. Even during periods of no unrests, the time-varying probability of unrests amplifies and propagates economic and political shocks in these countries, and hence, their business cycles are more volatile, and shocks are more persistent.

Data and methodology. To answer these questions, we employ a recently developed dataset, the Nonviolent and Violent Campaigns and Outcomes database (Chenoweth (2013)), which documents an exhaustive list of *mass* and *organized* political campaigns from 1960 to 2006 around the world.[1] We combine this with well-known time-series databases of coups (Marshall and Marshall (2011)), the quality of political institutions (Marshall and Jaggers (2002)'s Polity IV score) and important macroeconomic variables (output, investment, trade, inflation and exchange rate dating back to 1960, from the World Bank's World Development Index). This gives us time-series data of 157 countries, 135 unrest episodes and 161 coups.

Second, we augment the standard panel vector-autoregression (VAR) approach in

[1]Since the data set ends in 2006, unfortunately, our sample does not include the latest episodes of unrest following the 2008 global economic crisis. However, understanding the various episodes in the past five decades undoubtably helps shed light on the current and on-going events.

macroeconomics with a *two-step regression method*, often used in the empirical microeconomic literature. In the first step, we estimate a probit to predict the incidence of regime change campaigns for each country. In the second step, we include this time-varying predicted probability into our panel VAR. This term allows us to consider the endogeneity between business cycles and political disruptions. The term is also an endogenous measure of time-varying political risks.

Findings. First, we find in the probit that, not surprisingly, economic downturns have significant correlations with unrests and coups. And, consistent with the political science literature, we find that the polity score has a non-linear relationship with political risks. Regimes that are either very democratic or very autocratic face small probabilities of mass unrests (and also small probabilities of coups). But regimes that are in the middle ("anocratic" regimes) are vulnerable, to both unrests and coups. However, the overall pseudo-R^2 of the probit regression is very small. This implies that it is difficult to predict political instability given our observable covariates. This is consistent with findings in the political science literature that political revolutions are hard to predict (Goldstone et al. (2010)), as they usually require unexpected "sparks" (Kuran (1989)), such as the self-immolation of the young merchant Mohamed Bouazizi that sparked the 2010 popular uprising in Tunisia.

Second, we find that unrests and coups have statistically and economically significant impacts on output growth and especially real investment growth. An average episode of unrest or coup, while not nearly as damaging as the large world wars of the twentieth century, lead to declines of output and investment growth large enough to qualify as "moderate rare disasters" (*each* year in unrest associated with a loss of output growth of four percentage points on average). Note that the average episode of unrest in our sample is seven years.

Finally, and most importantly, we find that the risk of unrests exerts a powerful influence on an economy. Our predicted probability of unrests is economically and significantly correlated to all six macroeconomic variables. This result is an example of the macroeconomic effects of time-varying uncertainty about large rare negative shocks. It is also the means by which wide-scale political disruptions, despite being rare, can exert considerable influence over a country's business cycles even in normal times.

Since the feedback between economic downturns and political uncertainty can amplify otherwise mundane economic shocks, political risk can sizably increase the volatility[2] of business cycles even if unrests are never actually observed. We illustrate this point by showing the impulse responses to a small 1 percentage point shock to output growth in two countries: one with a high polity score of 10, and one with a low polity

[2]And possibly skewness. However, we have not yet explored skewness in this draft.

score of 0 (and thus being in the "anocracy zone" of high political risk). In the low polity country, a negative shock to output growth increases the probability of unrest, which in turns dampen output and investment (and other variables) in the following period. Thus, through the political risk, output shocks become more persistent. This suggests that our measure of political risk captures an important source of time-varying uncertainty and volatility in many countries, especially those with polity scores that are neither too high nor too low.

Literature. Our paper provides estimates of the size, triggers and consequences of a certain type of the extreme events recently studied in the macroeconomic rare event literature Barro (2006, 2009), and identified by the "narrative approach" used in other studies to identify fiscal policy shocks Ramey and Shapiro (1998) and Ramey (2011). Recently, the time-varying probability of these rare events has been marshaled to explain a number of macroeconomic phenomena, such as in Gabaix (2012) and Wachter (2013). Like Berkman et al. (2011), we estimate a time-varying index of a specific kind of political risk. Building on and contributing to this literature, our goal is to explore how the time-varying probability of a specific kind of political event might explain how business cycles differ systematically between countries. Specifically, since our index is constructed by exploiting the extent to which political unrest can be predicted from variation over time in both observable economic and political conditions, we are able to derive novel implications for the amplification and propagation of shocks.

Our paper is also related to the macro literature on uncertainty shocks (see Bloom (2009), Christiano et al. (2013) and citations therein). A large literature (e.g. Fernández-Villaverde et al. (2011)) explores the extent to which fiscal policy uncertainty leads to significant losses on the business cycle frequency for developed economies. And if uncertainty about future marginal taxes can have significant effects, then surely the potential for regime change should as well. In the emerging market setting, it is known that policy uncertainty can act as a tax on private investment (Rodrik (1991)), and that higher policy uncertainty can lead to lower growth (Aizenman and Marion (1993)). It is also known that political risk is associated with wider spreads on sovereign debt (Bekaert et al. (2014)). But to our knowledge no paper has attempted to estimate the feedback between economic and political risk and its implications for business cycles. Our main contribution here is a constructed index of time-varying uncertainty that is derived from well-identified events in political science. In doing so, our estimation also provides a mechanism by which shocks to the growth rates of output of middle-income countries (which tend to be more politically unstable) might differ from those in upper-income countries (which tend to be more politically stable), both in that they tend to be more volatile (as documented in Koren and Tenreyro (2007)), and persistent (as documented

in Aguiar and Gopinath (2007)).

Our paper also relates to an empirical literature in political economy and growth that documents the relationship between democracy or democratizations and growth (see Barro (1996), Acemoglu and Robinson (2000, 2005, 2012), Rodrik and Wacziarg (2005), Papaioannou and Siourounis (2008) and references therein). This literature usually focuses on the impacts of democratic transitions, but does not consider the episodes of political turmoils that precede them. Furthermore, we believe our paper is the first to provide a panel VAR analysis of unrests. The VAR allows us to disentangle how different political (risk) shocks impact and propagate through the economy.

Our paper borrows insight from the political science literature, including Goldstone (2002)'s extensive survey of theories on political revolutions, and empirical work on predicting political violence such as Goldstone et al. (2010), Collier et al. (2005) and Fearon and Laitin (2003). While we confirm some of the main results of this literature in a novel setting, our main contribution here is to map out the implications this literature has for macroeconomic dynamics.

Finally, this paper builds on our own work on the Arab Spring. In Kent and Phan (2013), we take a careful look into why the Arab Spring revolutions happened, and how short- and long-run macroeconomic conditions might have influenced the different outcomes: relatively peaceful abdications in Tunisia and Egypt, but civil wars in Syria and Libya.

The plan of the paper is the following. In section 2, we describe our data sources. Section 3 documents our empirical work predicting unrest and estimating its impact, and then the impact of the *risk* of unrest. Section 4 uses impulse responses to study the dynamics of unrests and the risk of unrests. Section 5 concludes.

2 Data

Unrests. We draw data on mass political unrests from the NAVCO (Nonviolent and Violent Campaigns and Outcomes) dataset, version 2.0. NAVCO provides detailed information on a "consensus population" of 250 known violent and non-violent mass political campaigns between 1945 and 2006.

Each *campaign* is a series of observable (i.e., tactics used are overt and documented), continuous (distinguishing from one-off events or revolts), mass tactics or events in pursuit of a political objective. According to Chenoweth (2013), campaigns have "discernible leadership and often have names, distinguishing them from random riots or spontaneous mass acts".

The NAVCO dataset also gives (among other information) the country, the main participating groups, the documented objective of the movement, the presence of vi-

olence, and the degree to which the movement was successful at achieving the documented objective. The complete categorization of objectives is: (0) regime change, (1) significant institutional reform, (2) policy change, (3) territorial secession, (4) greater autonomy, (5) anti-occupation and (-99) unknown. Since we are not interested in secession, autonomy or anti-occupation in this paper, *we* restrict our attention to campaigns whose objectives are either (0), (1) or (2)[3]. According to NAVCO's codebook, these objectives are defined as follows:

(0) *Regime change* indicates a goal of "overthrowing the state or substantially altering state institutions to the point that it would cause a de facto shift in the regime's hold on power".

(1) *Significant institution reform* indicates a goal of "changing fundamental political structures to alleviate injustices or grant additional rights".

(2) *Policy change* indicates a goal of "changes in government policy that fall short of changes in the fundamental political structures, including changes in a state's foreign policy".

Overall, the NAVCO dataset gives us 84 unrests around the world between 1960 and 2006,[4] with an average duration of 5.86 years [5] [6].

Each campaign has an onset year and an end year. The onset year is defined to be the first year with a series of coordinated, contentious collective actions, with at least 1,000 observed participants. The campaign is recorded as over if peak participation drops below 1,000.[7] Since we are investigating the impact of political unrest and unrest risk on business cycles, periods of high political and economic uncertainty are of special interest. When a country enters an episode of unrest, such as Thailand in 2005-2006,

[3]Two of 86 campaigns that satisfy these conditions are coups (the attempted coup in Argentina 1987, and Pinochet's coup in Chile 1973). Since we explicitly consider coups later, in the Center for Systemic Peace dataset, we exclude these two events from our sample from NAVCO.

[4]Even though NAVCO data dates back to 1945, 1960 is the year we begin to have economic data from WDI. And 2006 is the last year NAVCO 2.0 data is available.

[5]Episodes can begin or end at any day in the year. As a simplification, we code a year as belonging to the crisis if at any point in that year a country is in crisis.

[6]Note that countries of all polity scores, from full autocracy to full democracy are included as potential targets for these events. For example, the 2005 protests in Thailand that preceded the 2006 coup took place when Thailand had a polity score of 9, or almost a full democracy.

[7]The cut-off threshold of 1,000 is taken from the Correlates of War (COW)'s standard of reporting conflicts.

or Egypt in the ongoing Arab Spring revolution,[8] there is a vast amount of uncertainty about the country's political and economic institutions. And it is not a coincidence that such episodes are associated with sharp drops in investment, which is known to be sensitive to uncertainty Bloom (2009). The fact that unrests are usually lengthy episodes, lasting more than five years on average, is a desirable properties for our purpose[9].

Coup. To contrast against episodes of unrests, we also consider coups, which are usually short events, rarely lasting for more than one year. If our theory above is correct, then the impact of a lengthy period of unrest on investment must be larger than the impact of a coup on investment. To verify this hypothesis, we incorporate the Center for Systemic Peace's dataset Marshall and Marshall (2011) of all known coups from 1946 to 2012. This gives us 161 coups from 1960 to 2012.

Polity. For an index of the quality of democratic institutions in each country, we use the standard PolityIV dataset Marshall and Jaggers (2002). This widely-used index is a composite measure of key characteristics of executive recruitment, constraints on executive authority, and the degree of political competition. We use the Polity2 index, which runs from -10 (fully autocratic) to +10 (fully democratic). We also include the Polity index of -77 (interregnum) for state failure, and -88 for transition.

Macroeconomics. Finally, we use annual panel macroeconomic data of 154 countries listed in the World Bank's World Development Indicators database, over the interval 1960-2011. This includes six time-series: real output, real investment, inflation, the nominal exchange rate against the US dollar, real imports and real exports.

3 Evidence

In this section we document several new stylized facts: one, mass unrests are difficult to predict; two, mass unrests are very economically disruptive when they happen; three, even small changes in the probability of mass unrests can have significant economic impacts.

[8] As mentioned in the introduction, unfortunately the Arab Spring revolutions in the Middle East and North Africa since 2010, as well as the unrest in Thailand and Ukraine in 2014, are not reported in our data set, as NAVCO ends in 2006.

[9] It is worth noting that most democratization episodes between 1960 and 2011 (as documented by Papaioannou and Siourounis (2008)) are preceded within four years by unrests. In fact, 27 out of 38 full democratizations (71%), and 14 out of 24 partial democratizations (58%) are preceded by mass unrests.

3.1 Econometric Specification

The vector of endogenous variables Y are real output, real investment, inflation, the nominal exchange rate against the US dollar, real imports and real exports. All variables, except inflation, are in logs.

3.1.1 Predicting Revolutions

Our empirical goal is to measure the causes and effects of unrests. To estimate the causes, we model the process of how countries enter and exit from the state of unrest as an *endogenous* threshold process. In the data, we say that a country in year t is in a state of unrest (or synonymously, in a state of unrest) if year t falls in a NAVCO episode.

To construct an endogenous probability of the onset of a period of unrest, we posit that there is a stochastic "index of discontent" Z_{it} that, when positive, is necessary and sufficient for a country to transition into a state of unrest. The index of discontent is a linear function of a set of lagged political covariates Q_{it-1}, a vector ΔY_{t-1} of lagged growth rates of our endogenous economic measures (real output, real investment,...) and an exogenous shock η_{it}. The vector Q_{it-1} of political variates includes the Polity2 score ($Polity_{t-1}$) and the square of the Polity2 score. Formally:

$$Z_{it} = Q_{it-1}\beta_z + \Delta Y_{it-1}\gamma_z - \eta_{it} \tag{1}$$

$$\eta_{it} \sim N(0,1), \text{ i.i.d.} \tag{2}$$

$$\Pr(Unrest_{it} | \sim Unrest_{it-1}) = \Pr(Z_{it} > 0) = \Phi(Q_{it-1}\beta_z + \Delta Y_{it-1}\gamma_z) \tag{3}$$

The exogenous shock η_{it} captures factors leading to unrest that are unobservable to the econometrician, which we call "sparks". As Kuran (1989) argues, political unrests are usually sparked by unanticipated events or sequences of events, such as the self-immolation of a dissident, or the leadership of charismatic leaders like Vladimir Lenin or Ayatollah Khomeini, and the underlying factors leading up to these events are very unlikely to be observable to the econometrician. Our measure $\hat{P}_{it}$ does not capture the direct incidence of these unobservable sparks, but instead the ex-ante probability that a spark will be large enough to tip a country into unrest. From the rare disaster literature, we know that large rare shocks can exert influence over economic decisions even in periods when the shocks do not occur. This is because the mere potential for these large rare shocks can drive investment, savings, asset prices, and other business cycle phenomena. In our framework, we are curious if small movements in the probability of entering into unrest can have significant impacts on the business cycles. Hence, armed with estimates $\hat{\beta}_z$ and $\hat{\gamma}_z$, we construct our time-varying probability of entering into

unrest P_{it}:

$$\hat{P}_{it} = \hat{\Pr}(Unrest_{it}| \sim Unrest_{it-1}) = \Phi(Q_{it-1}\hat{\beta}_z + \Delta Y_{it-1}\hat{\gamma}_z) \tag{4}$$

3.1.2 Consequences of Revolutions

To estimate the effects of unrest, we assume that each variable in Y (for example, real output) is the sum of a country- and series-specific time trend and deviations from that trend. Since most of the variables in Y are in logs, these time trends are constant-growth trends. The deviations of each variable from trend are linear functions of a vector X_{it-1} of political covariates, lagged growth rates of economic covariates Y, and a nonlinear function δ_y of the fitted probability of unrest $\hat{P}_{it}$ (this term will capture the effect of political risk of unrest onset). The vector X_{it-1} of political variates includes an indicator for being in a coup ($Coup_{t-1}$), an indicator for being a failed state ($StateFailure_{t-1}$), an indicator for being in a NAVCO event ($Unrest_{t-1}$), an indicator for five years or later following conclusion of a NAVCO event ($MoreThanFiveYearsAfterUnrest_{t-1}$), and the Polity4 score ($Polity_{t-1}$).

$$\Delta Y_{it} = \underbrace{X_{it}\beta_y}_{\text{baseline effects}} + \underbrace{\delta_y(\hat{P}_{it})}_{\text{political risk effects}} + \Delta Y_{it-1}\gamma_y + \alpha_i + \alpha_t + \epsilon_{it} \tag{5}$$

$$\epsilon_{it}|X_{it} \sim N(0,1), \text{ i.i.d.} \tag{6}$$

$$\epsilon_{it} \perp \eta_{it} \tag{7}$$

The last assumption is for identification. It says that the unobserved sparks to unrest do not themselves boost or hinder the growth in economic outcomes ΔY_{t-1}.

The country fixed effects on growth rates allow us to identify variation within countries over time as they enter and exit NAVCO events and experience changes in political conditions. The time fixed effects aim to capture global factors that affect the business cycles of all countries simultaneously. The coefficients on NAVCO events ($Unrest$) and afterwards ($MoreThanFiveYearsAfterUnrest$) capture the disruption due to the event itself and the contribution of potential institution-building on the following recovery. We include coups and state failures to distinguish them from the potentially different and sometimes concurrent effects of unrest. We include the probability of *entering* unrest, but we do not include an estimate for *remaining* in unrest. Implicitly the average effect of the probability remaining in unrest is included by the coefficient on $Unrest$.

A word of caution: One shouldn't interpret the term $\hat{P}_{it}$ as the "true" probability of entering into unrest. This is because the "true" probability of unrest is potentially a function of many variables that are not included in our specification (because of data availability). This means that the constructed series $\hat{P}_{it}$ depends on which variables

we include in the estimation of the probit. Instead, $\delta_y \hat{P}_{it}$ should be interpreted as the impact of the predictors Q_{it-1} and ΔY_{it-1} within the probit, to the extent that they are correlated with the onset of unrest. We include a nonlinear transformation of $\hat{P}_{it}$ (in addition to the nonlinearity of the probit itself) to further help us distinguish the *direct* effects of polity and ΔY from the effect that these covariates have *via the onset of unrest.*

3.2 Results

As planned, we estimate the model in two parts: First, we estimate a probit to predict the incipience of unrest via maximum likelihood. Second, taking from the probit the fitted probabilities of entering a state of unrest, we estimate the panel regression to find the country-specific trends and effects of unrest and polity change.

3.2.1 Predicting Revolutions

Table 1 reports probit estimates predicting the incidence of NAVCO event in period t conditional on there being no NAVCO event in period $t-1$. There are no country fixed effects in this specification. Since we estimate this probit via maximum likelihood, including a country fixed effect would effectively remove from the sample any country that never experienced unrest in our sample time span[10]. We want our probit to exploit the fact that some countries never experience unrest in estimating the coefficients β_z and γ_z. Additionally, the fitted probabilities $\hat{P}_{it}$ for any country that never experienced unrest in our sample would be 0 and constant in a specification with country fixed effects, and we want to allow for the possibility that the probability of unrest for these countries was actually non-zero and time-varying. As a robustness exercise in the Appendix, we consider a specification for the probit regression that includes regional fixed effects. The coefficients are not substantially changed by their inclusion. In the Appendix we also consider a specification that includes time fixed effects. These could capture potential contagion or spillover effects between countries in a given year. It turns out that the inclusion of these fixed effects doesn't substantially change the coefficients either. As a further robustness exercise, we also consider a logit specification. The marginal effects from the logit are not substantially different from those found with a probit. Therefore, when constructing $\hat{P}_{it}$ in our VAR, we use the coefficients obtained from the specification without any region or time fixed effects.

As seen in Table 1, falls in output growth today make unrest more likely tomorrow. For a country at the mean of the sample, when output growth declines by 1%, the

[10]Maximum likelihood would send the fixed effects of these countries to $-\infty$.

probability of unrest in the following period increases by 0.257%. Changes in growth rates of the other endogenous economic variables do not give rise to any significant changes in the probability of unrest. This is not surprising, since the growth rates of the other endogenous economic variables are generally correlated with the growth of output.

The negative coefficient on the linear term $Polity_{t-1}$ means that more democratic countries have lower probability of unrest. The negative coefficient on $Polity^2_{t-1}$ means that the more extreme a country's polity is, in either the democratic or autocratic direction, the lower the probability of unrest. The coefficient on $Polity^2_{t-1}$ highlight an "anocracy effect" (or "middle polity instability effect") as also documented in Goldstone et al. (2010) and others: political instability rises as a country becomes more anocratic (not too autocratic, but not too democratic).

The coefficients on $Polity_{t-1}$ and $Polity^2_{t-1}$ may seem small, but an increase from a neutral polity to a strongly democratic one is an increase in $Polity_{t-1}$ of 10 points, and an increase in $Polity^2_{t-1}$ of 100 points. Summing up the marginal effects, this would mean a reduction in the probability of unrest by 6.6%, which is quantitatively significant.

The final noteworthy result is that the pseudo-R^2 is only 0.08. This tells us that there are other factors not in the regression that explain the incidence of unrest. This isn't surprising, given that mass unrest is a rare event. While there are many countries with middlingly undemocratic regimes and low levels of output growth, when taken over all countries and over all years, unrest is a phenomenon that not many countries experience. In other words, the significant factors in our probit are strongly associated with but not sufficient for unrest. Thus our probit is evidence that another factor is at play: a shock, unseen to the econometrician, that enables the mass of protestors to overcome the coordination problem and effectively mount a movement. Revolutions, as argued by Kuran (1989) and others in the political economy literature, need sparks.

3.2.2 Consequences of Revolutions: Baseline Effect and Political Risk Effect

Tables 3 through 8 display the estimates for each element of equation (5) individually. Columns (1) and (2) report the impacts of political conditions without including lagged endogenous economic conditions or the fitted probabilities of unrest. The presence of country fixed effects means the regression is exploiting within-country variation.[11] The inclusion of time fixed effects in specification (2) slightly reduce the direct

[11]These regressions were run with Stata's *xtreg* command and with standard errors clustered at the country level.

impacts of political conditions, as compared with specification (1). The third column adds lagged endogenous variables. The autoregressive coefficient on output growth is small but significantly positive, meaning there will be some propagation of economic shocks.[12] The fourth column re-estimates the specification of the third column under the dynamic panel estimator of Arellano and Bond (1991). The fifth and sixth columns include two series for the estimated probability of unrest $\hat{P}_{it}$. In the fifth column, the series is constructed from a probit model; in the sixth, a logit.

Table 3 shows the regression results for the growth rate of output (that is, the first difference in the logarithm of output). The table shows that political covariates have significant impacts on output growth, both economically and statistically. For the specifications without $\hat{P}_{it}$ (columns 1 to 4), every year in which a coup takes place is associated with an additional decline in output growth of between 1 and 2.1 percentage points, significant in all specifications on at least the 5% level. State failures have a negative impact in all of these four specifications. When the effect is significant, it is large: a drop in output growth of between four and five percentage points for each year in which the state has failed. The effect of polity is close to zero and insignificant when $\hat{P}_{it}$ is not included.

The existing literature on democratization and growth finds a significant increase in the growth rate of output following a sharp increase in a country's polity score. Given that there is considerable overlap between the episodes considered in that literature and our NAVCO incidents of unrest, our estimate of the effect of *MoreThanFiveYearsAfterUnrest* might capture the same phenomenon. However, we find the effect to be small and not generally statistically significant. But this is not inconsistent with the literature. The coefficient on *MoreThanFiveYearsAfterUnrest* is the difference in growth relative *not* to the time period immediately before the end of the event, but relative to the long-term trend. In our estimation, the only dividend to democratization analogous to what was found in the literature is the relief from the effects of the unrest that were associated with that democratization.

Column 3 shows that including the ΔY_{it-1} terms slightly dampens the effects of X_{it}. This is because there is some degree of internal propagation arising from the inclusion of the autoregressive coefficients. To the extent that shocks to X_{it} last for multiple periods, and to the extent that the autoregressive coefficients of a VAR give rise to internal propagation of shocks, the average predicted deviation from trend attributable

[12]Within the VAR literature, coefficients on ΔY_{it-1} are not reported in a table such as this, since the statistical and economic significance of an estimated VAR are usually better conveyed in impulse response functions rather than in individual coefficients. However, we report them here to help illustrate the political risk effects that the fitted probability $\hat{P}_{it}$ represents.

to a shock to X_{it} will be larger than the coefficient displayed in the table.[13] However, the fact that there's not much difference between including and excluding ΔY_{it-1} (that is, between columns 2 and 3) indicates that there's not much internal propagation arising from the autoregressive coefficients. This is to be expected since the endogenous variables in the VAR are growth rates, not levels.

Political risk effects

We now discuss the effects of $\hat{P}_{it}$. Recall that $\hat{P}_{it}$ is the probability of unrest that we can predict from a given set of covariates. This is not the spark. This is entirely a function of other covariates that are included here. Instead, the inclusion of this term accomplishes something very specific: *it introduces an essential nonlinearity in the VAR due to political risk of unrest.*

The table reports coefficients for both $\hat{P}_{it}$ and $\hat{P}_{it}^2$. They are always of different signs, which means that the impacts of $\hat{P}_{it}$ exhibit diminishing returns. And they are both very statistically and economically significant.

We want to stress that one cannot interpret these coefficients directly as marginal effects. The marginal effect of a change in political covariates or lagged economic conditions will vary to the extent to which those changes are associated with increases in the probability of unrest. The only marginal effects one can speak of are those of political or lagged economic conditions, not of $\hat{P}_{it}$ directly. For example, the marginal effect of an increase in lagged inflation acceleration on current output growth is:

$$\begin{aligned}\frac{d\Delta y_{it}}{d\Delta \pi^{j}_{it-1}} &= \gamma_{Y,\pi} \\ &+ \delta_{Y,\hat{P}}\gamma_{\hat{P},\pi}\phi(Q_{it-1}\hat{\beta}_z + \Delta Y_{it-1}\gamma_z) \\ &+ 2\delta_{Y,\hat{P}^2}\gamma_{\hat{P},\pi}\Phi(Q_{it-1}\hat{\beta}_z + \Delta Y_{it-1}\gamma_z)\phi(Q_{it-1}\hat{\beta}_z + \Delta Y_{it-1}\gamma_z)\end{aligned}$$

The first term is the baseline effect as reported as the coefficient on $\Delta Output_{t-1}$ in Table 3. We denote the terms on the second and third lines as the "political risk effect" because these describe the impact of lagged inflation acceleration via its change in the probability of unrest. The political risk effect depends on the estimated coefficients $\delta_{Y,\hat{P}}$ and $\delta_{Y,\hat{P}^2}$ of polity and its square from Table 3, and the coefficient of inflation's effect $\gamma_{\hat{P},\pi}$ as estimated in the probit. In words, lagged inflation acceleration propagates

[13] Another way to see this is to note one could calculate the difference in ergodic means between a country that is permanently in a state of tranquility versus one that is permanently in a state of unrest, and note that the average deviation of a country in unrest from trend will depend both on how far the ergodic means are from each other and how long it takes to transition between ergodic means relative to the average duration of unrest.

to current output growth through three channels: the baseline effect, the extent to which lagged inflation changes the probability of unrest, and the extent to which the probability of unrest influences current output growth.

Therefore, in specifications that contain $\hat{P}_{it}$, what we called the "baseline effects" are interpreted as the effects that one would observe in the absence of the political risk effect. In times when the probability of unrest is very small, $Q_{it-1}\hat{\beta}_z + \Delta Y_{it-1}\gamma_z$ is large, $\phi(Q_{it-1}\hat{\beta}_z + \Delta Y_{it-1}\gamma_z)$ is small, and therefore the political risk effect is small. Because of the nonlinearity of the political risk effects, including the term $\hat{P}_{it}$ in the regressions allows us to meaningfully distinguish the marginal effects of political and economic conditions between countries that are prone to unrest and those that are not.

The inclusion of $\hat{P}_{it}$ changes not just the size but the statistical significance of the coefficients on some of the covariates. For example, in specifications (1) through (4), the marginal effect of polity is restricted to be just the baseline effect, pooled over both the unrest-prone and stable countries. In all four specifications this is estimated to be indistinguishable from zero. However, in specifications (5) and (6), we see that for countries that are not prone to unrest, the baseline effect of a change in the polity score is significantly statistically different from zero. Furthermore, the coefficient on $\hat{P}_{it}$ is significantly different from zero, meaning that the contribution of the political risk effect is significant. Figure 1 plots the change in output growth relative to trend (up to the country fixed effect) as a nonlinear function of polity for a synthetic country.

The inclusion of $\hat{P}_{it}$ also allows us to meaningfully distinguish the propagation of shocks between unrest-prone and stable countries. This is the second reason why we report the coefficients on lagged economic variables. The addition of $\hat{P}_{it}$ reduces the baseline autocorrelation of output growth. Effectively, this means that countries that are not prone to unrest have lower output growth autocorrelations than countries that are prone to unrest. We explore this result in much greater detail in later sections.

Remark. Why does the coefficient on unrest increase once we include the fitted probabilities $\hat{P}_{it}$? It is because there are two effects from being in unrest in this specification. The first is the direct loss from entering unrest. The second is that, after the first period of unrest, there are no longer any influence of $\hat{P}_{it}$. This is because $\hat{P}_{it}$ is only present in periods that were preceded by no unrest. The regression accords a larger direct effect to unrest in the specifications with $\hat{P}_{it}$ because this direct effect has to "overcome" the average estimated effect of relief from $\hat{P}_{it}$. The economic implication of this result is that countries that experience unrest tend to lose a larger amount of output growth if they were less likely to experience unrest ex-ante. In other words, the baseline effect of unrest is underestimated in specifications (1)-(4) for more stable countries.

Impacts on other economic variables

Table 4 shows that the disruptive effects of unrest and the probability of unrest are generally twice as big for investment as output. All in all, these results are broadly consistent with Noe and Shiferaw (2013), who find micro panel evidence that low-intensity internal armed conflict depresses the level of investment by about 5% of the firm's total capital stock. However, in contrast to output, the effects of state failure and coups are not statistically significant once we include $\hat{P}_{it}$.

Tables 5 and 6 offer an unexpected asymmetry between real export growth and real import growth. The baseline effect of unrest on real import growth is larger than that of output and smaller than that of investment. Additionally, introducing $\hat{P}_{it}$ in specifications (5) and (6) lowers the baseline response of real imports growth to lagged output growth. This implies that lagged output growth has a larger effect on imports growth in countries that are more prone to unrests. However, the responses of real export growth to unrest are not significant even at the 10% level. The mechanism behind this asymmetry is an interesting line of research but left as an open question. One result is the same across both imports and exports: both grow at a rate faster than trend in the period starting five years after the conclusion of unrest. One of the legacies of unrest seems to be a substantially more open economy.

In table 8, we see that most baseline effects of political and economic conditions, with the exception of polity, are statistically insignificant. However, since the coefficient on the political risk effect is large and statistically significant, we can infer that a change in economic or political conditions will have a statistically significant effect on inflation acceleration to the extent that it increases the probability of unrest. In addition, the incidence of unrest is significantly statistically associated with acceleration in inflation, and more so for countries that were not prone to unrest ex-ante. The lack of many statistical significant results in Table 7 is consistent with the generally held result that exchange rates are difficult to predict.

4 Dynamics of Revolutions: Actual and Risk

We perform two experiments to convey the dynamics of a representative episode of unrest and the effects of political risk of unrest. These experiments illustrate the timing assumptions of the model, the combination of several effects that occur before, during, and after an episode of unrest, and the effects of unrest on the persistence of other shocks. We present impulse response functions of each endogenous variable Y for each experiment, under the coefficients in specification (4) above, that is, including both lagged endogenous variables ΔY_{it-1} and fitted probabilities $\hat{P}_{it}$. For all experiments, we

sample coefficients from the multivariate normal distribution implied by the regression results, calculate impulse responses for each coefficient draw, then plot the median and the period-wise 95% confidence interval over 200 draws.

The nonlinearity of $\hat{P}_{it}$ in ΔY_{it-1} poses some problems. For convenience, we linearize $\hat{P}_{it}$ in ΔY_{it-1}. This guarantees, for each value of polity, a unique tranquil[14] steady state of ΔY_{it-1}. We do this to rule out exotic dynamics arising from transition between various possible steady states of the nonlinear model. Since the sample growth rates are usually small, this is a reasonable first-order approximation. For each draw, we assume a draw-specific country fixed effect such that the ergodic growth rate of output across all draws was constant.

First experiment: Unrest shock

Suppose that a hypothetical country starts at the pre-unrest trend in year 1, is in the unrest state in years 2 through 7 (shaded), and emerges into a post-unrest state from year 8 onward. In Figure 2 we plot responses of the growth rates of output, investment, exports, imports, nominal exchange rate depreciation, and inflation in response to these regime changes, relative to a country that stays at the pre-unrest trend throughout. The shocks ϵ are held constant at 0 in these responses.

In this experiment we have a number of effects that occur in sequence. The timing of these effects is as follows: In period 1, the country is at trend, or its ergodic mean. An unanticipated shock hits the country in period 2. This is the spark which plunges the country into a state of unrest. In period 2 the country still has the effect from political risk since period 1 was not a period of unrest. This effect is not present in period 3. After period 2 the country quickly moves to a new in-unrest ergodic mean. The confidence intervals widen over the next 3 periods, indicating uncertainty in the estimates of the VAR autoregressive matrix. The country emerges from unrest in period 8. There are spikes in output, investment and imports in period 8 because the direct effect of unrest has lifted, and the effect of political risk is not yet present. From period 9 onward, the anticipatory effect is back, together with the post-unrest effect. The limiting value is the ergodic mean in a post-unrest state. The confidence interval around this point is the combination of the estimation uncertainty about the effect of the post-unrest state, estimation uncertainty about the effect of the political risk of unrest, and the estimation uncertainty on the VAR autoregressive matrix.

[14]That is, conditional on there being no unrest, no coup and no state failure.

Second experiment: Output shock

Suppose that a hypothetical country starts at the pre-unrest trend in year 1, and experiences an exogenous shock to ϵ_{it} that causes the growth rate of output to fall by one percent in period 2 only. In Figure 3 we plot responses of the growth rates of economic quantities relative to a country that stays at a trend where the shocks ϵ are held constant at 0 throughout. The goal of this exercise is to show how endogenous changes in the probability of unrest influence the propagation of shocks. To this end, experiment 2 plots the responses of two countries to the same shock: one with a polity score of 10, and one with a polity score of 5. In these experiments, the polity scores do not change over time. We have also chosen country fixed effects for each country so that they share the same ergodic mean growth rate of output.

For the high-polity country, the probability of unrest stays close to 0 throughout the experiment. For the middling-polity country, the probability of unrest varies more over time. This is a consequence of the nonlinearity of $\hat{P}_{it}$ in polity and ΔY_{it-1}. Consider the linearization of $\hat{P}_{it}$ in ΔY_{it-1} about the ergodic mean $\bar{\Delta}_i$:

$$\hat{P}_{it} = \Phi(Q_{it-1}\hat{\beta}_z + \Delta Y_{it-1}\hat{\gamma}_z) \tag{8}$$

$$\approx \Phi(Q_{it-1}\hat{\beta}_z + \bar{\Delta}_i\hat{\gamma}_z) + \phi(Q_{it-1}\hat{\beta}_z + \bar{\Delta}_i\hat{\gamma}_z)(\Delta Y_{it-1} - \bar{\Delta}_i)\hat{\gamma}_z \tag{9}$$

For the high-polity country, $Q_{it-1}\hat{\beta}_z$ is negative and large. This means both $\Phi(Q_{it-1}\hat{\beta}_z + \bar{\Delta}\hat{\gamma}_z)$ and $\phi(Q_{it-1}\hat{\beta}_z + \bar{\Delta}\hat{\gamma}_z)$ are close to zero for the high-polity country. For the middling-polity country, $Q_{it-1}\hat{\beta}_z$ is still negative but not so large, so both $\Phi(Q_{it-1}\hat{\beta}_z + \bar{\Delta}\hat{\gamma}_z)$ and $\phi(Q_{it-1}\hat{\beta}_z + \bar{\Delta}\hat{\gamma}_z)$ are not as small as for the high-polity country. Therefore, for the middling-polity country, not only is the ergodic mean of $\hat{P}_{it}$ larger, but it also responds more to movements in ΔY_{it-1}.

Figure 3 illustrates this. For the high-polity country, the shock to output growth propagates more or less strictly as a VAR; the effect from the variation in $\hat{P}_{it}$ is negligible. However, for the middling-polity country, the shock to output growth in period 2 lives on as an increase in $\hat{P}_{it}$ into period 3. The increase in the probability of unrest dampens output growth in period 3 relative to the high-polity country. This dampening, in turn, implies that $\hat{P}_{it}$ remains elevated into period 4, which dampens output in period 4, and so on. The total effect of the responsiveness of $\hat{P}_{it}$ to shocks to output growth is to increase the persistence of those shocks.

Figure 3 shows that a higher probability of unrest is associated with a large loss of output relative to trend. To this extent, our findings are consistent not only with the rare disaster literature (e.g., Barro (2006)) but also with studies that estimate the macroeconomic consequences of shocks to uncertainty, such as in Christiano et al. (2013)

and Bloom (2009). Our main contribution to this literature is that our constructed index of uncertainty is derived from well-identified events and the observable covariates that predict them.

This difference in propagation between these two countries implies a difference in the unconditional moments associated with endogenous economic series as well. Suppose that both the high-polity and the middling-polity countries are subject to innovations drawn from the same distribution. Using the VAR model, we can calculate the unconditional moments of the time series for the endogenous economic variables for both countries. Table 9 shows that, even when subject to the same distribution of shocks, the less stable country has a greater volatility in output growth, investment growth, import growth, and inflation. Table 10 shows the same for the unconditional autocorrelation of each series. The endogenously time-varying probability of unrest acts as an amplification and propagation mechanism, giving a possible explanation for the facts documented in Aguiar and Gopinath (2007).

In conclusion, our estimates and experiments show: One, periods of mass unrest are rare and need sparks. Two, when mass unrest happens, the effects on the growth rates of output, investment, imports, exports, and inflation can be large and persistent. Three, the time-varying probability of such events acts both as an economically significant shock to uncertainty and as a mechanism which increases the propagation of other shocks.

5 Conclusion

This paper provides a novel empirical panel vector-autoregression framework, and employs a new database on political campaigns, to analyze the two-way relationship between political disruptions and business cycles. First, we find that anocracies (countries not too democratic and not too autocratic), as well as countries experiencing economic downturns, are more vulnerable to unrests and coups. Second, we document that the direct impacts of unrests and coups on business cycles are statistically and economically significant, amounting to "moderate rare disasters" (each year in unrest associated with a loss of output growth of four percentage points on average). Third, and this is the main contribution of the paper, we document that the time-varying uncertainty over the onset of political unrest has statistically and economically significant effects on the business cycles of a country prone to political unrest. In particular, this time-varying uncertainty is a novel amplification and propagation mechanism for economic and political shocks. As a consequence, unrest-prone countries have business cycles that are significantly more volatile. Furthermore, economic and political shocks have significantly more persistent impacts on these economies.

We believe that exploring the complex relationship between political disruptions and business cycles is an exciting avenue for future research, especially in light of the recent uprisings in many countries (including Egypt, Tunisia, Syria, Libya, Thailand and Ukraine) in recent years. This short paper attempts to be a building block in that wider project.

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Appendix

$Unrest_t \mid \sim Unrest_{t-1}$	Coefficient (standard error)	Marginal effect (standard error)
$Polity_{t-1}$	-0.031***	-0.0019***
	(0.01)	(0.00)
$Polity^2_{t-1}$	-0.006***	-0.0003***
	(0.00)	(0.00)
$\Delta Output_{t-1}$	-2.852***	-0.174***
	(1.00)	(0.06)
$\Delta Investment_{t-1}$	-0.131	-0.007
	(0.24)	(0.01)
$\Delta Exports_{t-1}$	0.294	0.017
	(0.29)	(0.02)
$\Delta Imports_{t-1}$	-0.294	-0.017
	(0.38)	(0.02)
$\Delta ExchangeRate_{t-1}$	-0.158	-0.010
	(0.14)	(0.01)
$\Delta Inflation_{t-1}$	0.478	0.029
	(0.28)	(0.02)
constant	-1.727***	
	(0.09)	
Pseudo-R^2	0.0818	
N	4222	

Table 1: Main probit to predict incipience of unrest. *: $p < 0.1$. **: $p < 0.05$. ***: $p < 0.01$.

$Unrest_t \mid \sim Unrest_{t-1}$	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$Polity_{t-1}$	-0.031***	-0.032***	-0.024**	-0.051***	-0.059***	-0.045***	-0.041***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)
$Polity^2_{t-1}$	-0.006***		-0.009***	-0.008**	-0.010**	-0.006***	-0.008***
	(0.00)		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
$Anocracy_{t-1}$		0.381**					
		(0.12)					
$\Delta Output_{t-1}$	-2.852**	-2.770*	-2.679*	-4.009**	-4.237*	-3.347**	-3.305**
	(1.00)	(1.10)	(1.11)	(1.35)	(1.65)	(1.06)	(1.17)
$\Delta Investment_{t-1}$	-0.131	-0.176	-0.180	-0.099	-0.208	-0.113	-0.152
	(0.24)	(0.27)	(0.26)	(0.29)	(0.34)	(0.25)	(0.27)
$\Delta Exports_{t-1}$	0.294	0.127	0.137	0.242	-0.077	0.276	0.132
	(0.29)	(0.32)	(0.31)	(0.38)	(0.45)	(0.30)	(0.33)
$\Delta Imports_{t-1}$	-0.294	-0.354	-0.359	-0.537	-1.092	-0.272	-0.368
	(0.38)	(0.42)	(0.42)	(0.46)	(0.57)	(0.39)	(0.43)
$\Delta ExchangeRate_{t-1}$	-0.158	-0.129	-0.110	-0.136	-0.017	-0.183	-0.137
	(0.14)	(0.16)	(0.16)	(0.14)	(0.16)	(0.15)	(0.17)
$\Delta Inflation_{t-1}$	0.478	0.285	0.251	0.601	0.358	0.517	0.297
	(0.28)	(0.31)	(0.31)	(0.36)	(0.40)	(0.28)	(0.31)
Country FE	No	No	No	**Yes**	**Yes**	No	No
Region FE	No	No	No	No	No	**Yes**	**Yes**
Time FE	No	No	**Yes**	No	**Yes**	No	**Yes**

Table 2: Robustness checks: Predict incipience of unrest, with country, region and time fixed effects.
*: $p < 0.1$. **: $p < 0.05$. ***: $p < 0.01$.

$\Delta Output_t$	(1)	(2)	(3)	(4)†	(5)	(6)
$Coup_t$	-0.019***	-0.018***	-0.015***	-0.014***	-0.011***	-0.011***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
$Interregnum_t$	-0.057***	-0.055***	-0.056***	-0.067***	-0.040*	-0.037*
	(0.01)	(0.01)	(0.02)	(0.01)	(0.02)	(0.02)
$Unrest_t$	-0.021**	-0.017**	-0.016**	-0.010***	-0.047***	-0.045***
	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)
$MoreThanFiveYearsAfterUnrest_t$	0.001	0.006	0.004	0.004	0.007**	0.007**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
$Polity_t$	-0.000	0.000	0.000	-0.000	-0.002***	-0.002***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
$Polity_t^2$	-0.000	-0.000	-0.000	-0.000*	-0.000***	-0.000***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
$\Delta Output_{t-1}$			0.145***	0.198***	0.116***	0.118***
			(0.03)	(0.02)	(0.03)	(0.03)
$\Delta Investment_{t-1}$			0.006	0.004	0.009	0.009
			(0.01)	(0.00)	(0.01)	(0.01)
$\Delta Exports_{t-1}$			0.018*	0.013*	0.007	0.008
			(0.01)	(0.01)	(0.01)	(0.01)
$\Delta Imports_{t-1}$			0.004	0.007	0.008	0.006
			(0.01)	(0.01)	(0.01)	(0.01)
$\Delta ExchangeRate_{t-1}$			-0.005	-0.003	0.001	0.001
			(0.00)	(0.00)	(0.00)	(0.00)
$\Delta Inflation_{t-1}$			0.002	0.001	-0.006	-0.005
			(0.00)	(0.00)	(0.00)	(0.00)
$\hat{P}(Unrest_t \mid \sim Unrest_{t-1})_{probit}$					-2.191***	
					(0.18)	
$\hat{P}(Unrest_t \mid \sim Unrest_{t-1})^2_{probit}$					2.983**	
					(0.92)	
$\hat{P}(Unrest_t \mid \sim Unrest_{t-1})_{logit}$						-2.083***
						(0.19)
$\hat{P}(Unrest_t \mid \sim Unrest_{t-1})^2_{logit}$						2.225***
						(0.35)
Year fixed effects	No	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.033	0.111	0.151		0.374	0.367
N	4816.000	4816.000	4558.000	4558.000	4532.000	4532.000

Table 3: Output: coefficient estimates. *: $p < 0.1$. **: $p < 0.05$. ***: $p < 0.01$; †: Arellano-Bond GMM.

$\Delta Investment_t$	(1)	(2)	(3)	(4)†	(5)	(6)
$Coup_t$	-0.027*	-0.025*	-0.029*	-0.030*	-0.018	-0.018
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
$Interregnum_t$	-0.251**	-0.249**	-0.164*	-0.122***	-0.118	-0.108
	(0.08)	(0.08)	(0.08)	(0.04)	(0.09)	(0.09)
$Unrest_t$	-0.047**	-0.040**	-0.046**	-0.027*	-0.142***	-0.135***
	(0.01)	(0.01)	(0.02)	(0.01)	(0.02)	(0.02)
$MoreThanFiveYearsAfterUnrest_t$	-0.003	0.008	-0.004	0.002	0.003	0.004
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
$Polity_t$	0.000	0.001	0.001	-0.000	-0.005***	-0.005***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
$Polity_t^2$	-0.000*	-0.000*	-0.000**	-0.001***	-0.002***	-0.002***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
$\Delta Output_{t-1}$			0.516***	0.544***	0.421***	0.427***
			(0.12)	(0.08)	(0.11)	(0.11)
$\Delta Investment_{t-1}$			-0.183***	-0.180***	-0.178***	-0.177***
			(0.03)	(0.02)	(0.04)	(0.04)
$\Delta Exports_{t-1}$			-0.034	-0.035	-0.065*	-0.062
			(0.04)	(0.02)	(0.03)	(0.03)
$\Delta Imports_{t-1}$			0.183***	0.204***	0.196***	0.193***
			(0.04)	(0.03)	(0.03)	(0.03)
$\Delta ExchangeRate_{t-1}$			-0.021	-0.017	-0.002	-0.005
			(0.02)	(0.01)	(0.01)	(0.01)
$\Delta Inflation_{t-1}$			0.004	-0.008	-0.018	-0.015
			(0.04)	(0.02)	(0.04)	(0.03)
$\hat{P}(Unrest_t \sim Unrest_{t-1})_{probit}$					-6.826***	
					(0.62)	
$\hat{P}(Unrest_t \sim Unrest_{t-1})^2_{probit}$					11.119***	
					(2.36)	
$\hat{P}(Unrest_t \sim Unrest_{t-1})_{logit}$						-6.347***
						(0.64)
$\hat{P}(Unrest_t \sim Unrest_{t-1})^2_{logit}$						7.828***
						(1.13)
Year fixed effects	No	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.015	0.050	0.083		0.195	0.188
N	4816.000	4816.000	4558.000	4558.000	4532.000	4532.000

Table 4: Investment: coefficient estimates. *: $p < 0.1$. **: $p < 0.05$. ***: $p < 0.01$; †: Arellano-Bond GMM.

$\Delta Exports_t$	(1)	(2)	(3)	(4)†	(5)	(6)
$Coup_t$	-0.032**	-0.028**	-0.023*	-0.032*	-0.025**	-0.026**
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
$Interregnum_t$	-0.061	-0.065	-0.089	-0.114***	-0.090	-0.089
	(0.06)	(0.06)	(0.06)	(0.03)	(0.06)	(0.06)
$Unrest_t$	-0.008	-0.009	-0.014	-0.011	-0.022	-0.020
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)
$MoreThanFiveYearsAfterUnrest_t$	0.014	0.022*	0.019*	0.005	0.021*	0.020*
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
$Polity_t$	-0.000	0.000	0.000	-0.000	-0.000	-0.000
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
$Polity_t^2$	-0.000	-0.000	-0.000*	-0.000**	-0.000*	-0.000*
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
$\Delta Output_{t-1}$			0.354**	0.419***	0.353**	0.353**
			(0.12)	(0.07)	(0.12)	(0.12)
$\Delta Investment_{t-1}$			-0.023	-0.009	-0.023	-0.024
			(0.04)	(0.02)	(0.04)	(0.04)
$\Delta Exports_{t-1}$			-0.069**	-0.061**	-0.074**	-0.074**
			(0.03)	(0.02)	(0.03)	(0.03)
$\Delta Imports_{t-1}$			0.011	-0.008	0.011	0.011
			(0.04)	(0.02)	(0.04)	(0.03)
$\Delta ExchangeRate_{t-1}$			0.023*	0.017*	0.025*	0.025*
			(0.01)	(0.01)	(0.01)	(0.01)
$\Delta Inflation_{t-1}$			0.004	0.007	0.003	0.003
			(0.02)	(0.02)	(0.02)	(0.02)
$\hat{P}(Unrest_t \mid \sim Unrest_{t-1})_{probit}$					-0.561	
					(0.71)	
$\hat{P}(Unrest_t \mid \sim Unrest_{t-1})^2_{probit}$					3.731*	
					(1.52)	
$\hat{P}(Unrest_t \mid \sim Unrest_{t-1})_{logit}$						-0.359
						(0.75)
$\hat{P}(Unrest_t \mid \sim Unrest_{t-1})^2_{logit}$						2.086
						(1.17)
Year fixed effects	No	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.004	0.102	0.122		0.125	0.125
N	4794.000	4794.000	4557.000	4557.000	4532.000	4532.000

Table 5: Exports: coefficient estimates. *: $p < 0.1$. **: $p < 0.05$. ***: $p < 0.01$; †: Arellano-Bond GMM.

$\Delta Imports_t$	(1)	(2)	(3)	(4)†	(5)	(6)
$Coup_t$	-0.027**	-0.024**	-0.019*	-0.017	-0.012	-0.013
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
$Interregnum_t$	-0.023	-0.027	-0.035	-0.051	-0.006	0.003
	(0.06)	(0.06)	(0.06)	(0.03)	(0.05)	(0.05)
$Unrest_t$	-0.014	-0.012	-0.011	-0.009	-0.084***	-0.077***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
$MoreThanFiveYearsAfterUnrest_t$	0.011	0.019*	0.018*	0.013	0.025**	0.025**
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
$Polity_t$	-0.000	0.000	0.001	0.000	-0.004***	-0.004***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
$Polity_t^2$	-0.000	-0.000	-0.000	-0.000	-0.001***	-0.001***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
$\Delta Output_{t-1}$			0.240**	0.329***	0.172*	0.177*
			(0.09)	(0.06)	(0.08)	(0.08)
$\Delta Investment_{t-1}$			0.013	0.005	0.016	0.017
			(0.03)	(0.01)	(0.03)	(0.03)
$\Delta Exports_{t-1}$			0.056*	0.054**	0.031	0.033
			(0.02)	(0.02)	(0.02)	(0.02)
$\Delta Imports_{t-1}$			-0.126***	-0.140***	-0.116***	-0.118***
			(0.03)	(0.02)	(0.03)	(0.03)
$\Delta ExchangeRate_{t-1}$			-0.008	-0.006	0.005	0.003
			(0.01)	(0.01)	(0.01)	(0.01)
$\Delta Inflation_{t-1}$			0.000	-0.009	-0.014	-0.012
			(0.02)	(0.01)	(0.02)	(0.02)
$\hat{P}(Unrest_t \sim Unrest_{t-1})_{probit}$					-5.190***	
					(0.47)	
$\hat{P}(Unrest_t \sim Unrest_{t-1})^2_{probit}$					11.098***	
					(1.78)	
$\hat{P}(Unrest_t \sim Unrest_{t-1})_{logit}$						-4.616***
						(0.43)
$\hat{P}(Unrest_t \sim Unrest_{t-1})^2_{logit}$						7.103***
						(0.88)
Year fixed effects	No	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.003	0.100	0.121		0.213	0.202
N	4794.000	4794.000	4557.000	4557.000	4532.000	4532.000

Table 6: Imports: coefficient estimates. *: $p < 0.1$. **: $p < 0.05$. ***: $p < 0.01$; †: Arellano-Bond GMM.

$\Delta ERDepreciation_t$	(1)	(2)	(3)	(4)†	(5)	(6)
$Coup_t$	0.013	0.011	0.009	0.012	0.011	0.010
	(0.02)	(0.02)	(0.02)	(0.03)	(0.02)	(0.02)
$Interregnum_t$	-0.095	-0.077	-0.069	-0.091	-0.063	-0.068
	(0.07)	(0.07)	(0.08)	(0.07)	(0.10)	(0.10)
$Unrest_t$	0.010	0.013	0.027	0.013	0.042	0.033
	(0.02)	(0.02)	(0.03)	(0.02)	(0.04)	(0.05)
$MoreThanFiveYearsAfterUnrest_t$	0.031	0.027	0.035	0.040*	0.034	0.034
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
$Polity_t$	-0.002	-0.001	-0.001	-0.001	-0.001	-0.001
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
$Polity_t^2$	-0.000*	-0.000*	-0.000*	-0.000	-0.000	-0.000
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
$\Delta Output_{t-1}$			0.112	0.074	0.131	0.122
			(0.25)	(0.15)	(0.26)	(0.26)
$\Delta Investment_{t-1}$			0.085	0.109**	0.089	0.087
			(0.09)	(0.04)	(0.10)	(0.09)
$\Delta Exports_{t-1}$			-0.156**	-0.107*	-0.150**	-0.153**
			(0.05)	(0.04)	(0.05)	(0.05)
$\Delta Imports_{t-1}$			-0.204	-0.311***	-0.209	-0.206
			(0.12)	(0.06)	(0.12)	(0.12)
$\Delta ExchangeRate_{t-1}$			-0.326***	-0.302***	-0.328***	-0.327***
			(0.09)	(0.02)	(0.09)	(0.09)
$\Delta Inflation_{t-1}$			0.206	0.165***	0.208*	0.207*
			(0.10)	(0.03)	(0.10)	(0.10)
$\hat{P}(Unrest_t \sim Unrest_{t-1})_{probit}$					1.042	
					(2.04)	
$\hat{P}(Unrest_t \sim Unrest_{t-1})^2_{probit}$					-7.637	
					(6.93)	
$\hat{P}(Unrest_t \sim Unrest_{t-1})_{logit}$						0.339
						(2.51)
$\hat{P}(Unrest_t \sim Unrest_{t-1})^2_{logit}$						-2.074
						(2.93)
Year fixed effects	No	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.001	0.029	0.133		0.135	0.134
N	4816.000	4816.000	4558.000	4558.000	4532.000	4532.000

Table 7: Exchange Rate Depreciation: coefficient estimates. *: $p < 0.1$. **: $p < 0.05$. ***: $p < 0.01$; †: Arellano-Bond GMM.

$\Delta Inflation_t$	(1)	(2)	(3)	(4)†	(5)	(6)
$Coup_t$	-0.003	-0.001	0.008	0.017	0.000	0.002
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
$Interregnum_t$	-0.070	-0.064	-0.077	-0.088*	-0.109	-0.114
	(0.07)	(0.07)	(0.08)	(0.04)	(0.12)	(0.12)
$Unrest_t$	0.025	0.024	0.035	0.029*	0.110***	0.102**
	(0.02)	(0.02)	(0.02)	(0.01)	(0.03)	(0.03)
$MoreThanFiveYearsAfterUnrest_t$	-0.003	-0.004	0.002	0.009	-0.006	-0.006
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
$Polity_t$	-0.001	0.000	0.000	0.001	0.005***	0.005**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
$Polity_t^2$	-0.000	-0.000	-0.000	-0.000	0.001**	0.001*
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
$\Delta Output_{t-1}$			-0.056	-0.020	0.020	0.016
			(0.10)	(0.09)	(0.12)	(0.12)
$\Delta Investment_{t-1}$			0.006	-0.005	0.003	0.004
			(0.06)	(0.02)	(0.06)	(0.06)
$\Delta Exports_{t-1}$			-0.033	-0.019	-0.007	-0.009
			(0.03)	(0.03)	(0.03)	(0.03)
$\Delta Imports_{t-1}$			0.029	-0.017	0.017	0.019
			(0.05)	(0.03)	(0.05)	(0.05)
$\Delta ExchangeRate_{t-1}$			0.021	0.004	0.006	0.009
			(0.02)	(0.01)	(0.02)	(0.02)
$\Delta Inflation_{t-1}$			-0.116	-0.102***	-0.100	-0.103
			(0.06)	(0.02)	(0.06)	(0.06)
$\hat{P}(Unrest_t \sim Unrest_{t-1})_{probit}$					5.406***	
					(1.18)	
$\hat{P}(Unrest_t \sim Unrest_{t-1})^2_{probit}$					-10.553***	
					(3.07)	
$\hat{P}(Unrest_t \sim Unrest_{t-1})_{logit}$						4.768***
						(1.36)
$\hat{P}(Unrest_t \sim Unrest_{t-1})^2_{logit}$						-7.612***
						(1.65)
Year fixed effects	No	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.002	0.039	0.053		0.111	0.100
N	4738.000	4738.000	4533.000	4533.000	4532.000	4532.000

Table 8: Inflation: coefficient estimates. *: $p < 0.1$. **:$p < 0.05$. ***: $p < 0.01$; †: Arellano-Bond GMM.

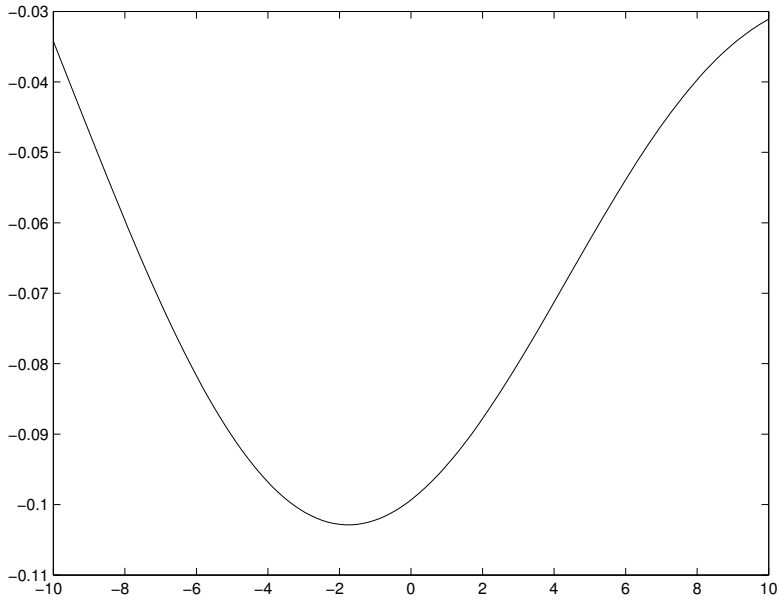

Figure 1: Change in output growth relative to trend (up to a country fixed effect) as a nonlinear function of polity for a synthetic country, constructed such that the ergodic mean of output growth is 2% per year and the value of the probability of unrest is equal to 2% (approximately the sample average) at a polity score of 7 (approximately the sample average).

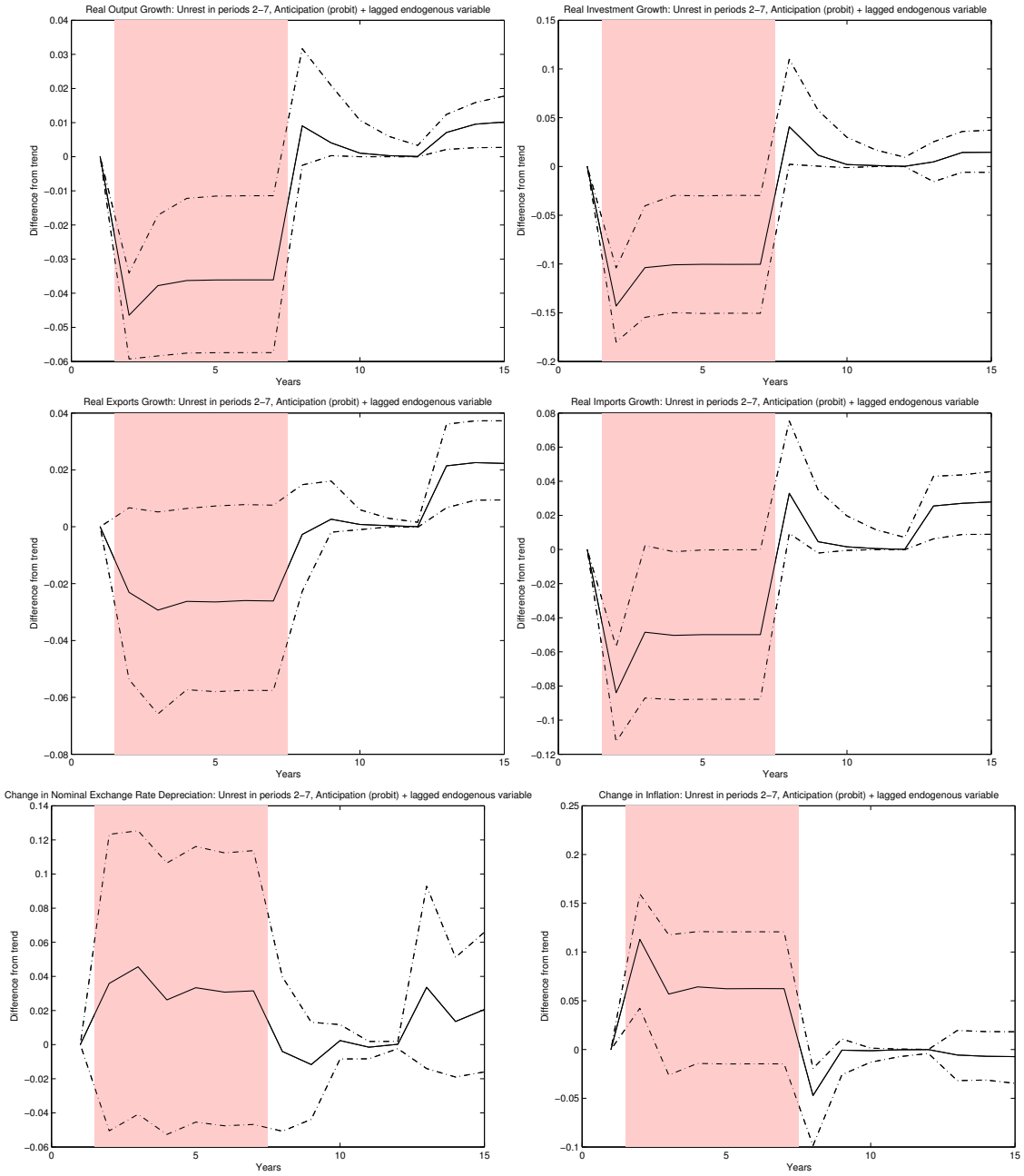

Figure 2: Experiment 1: Unrest in years 2-7, no other shocks. Growth rates relative to trend, 95% CI with medians

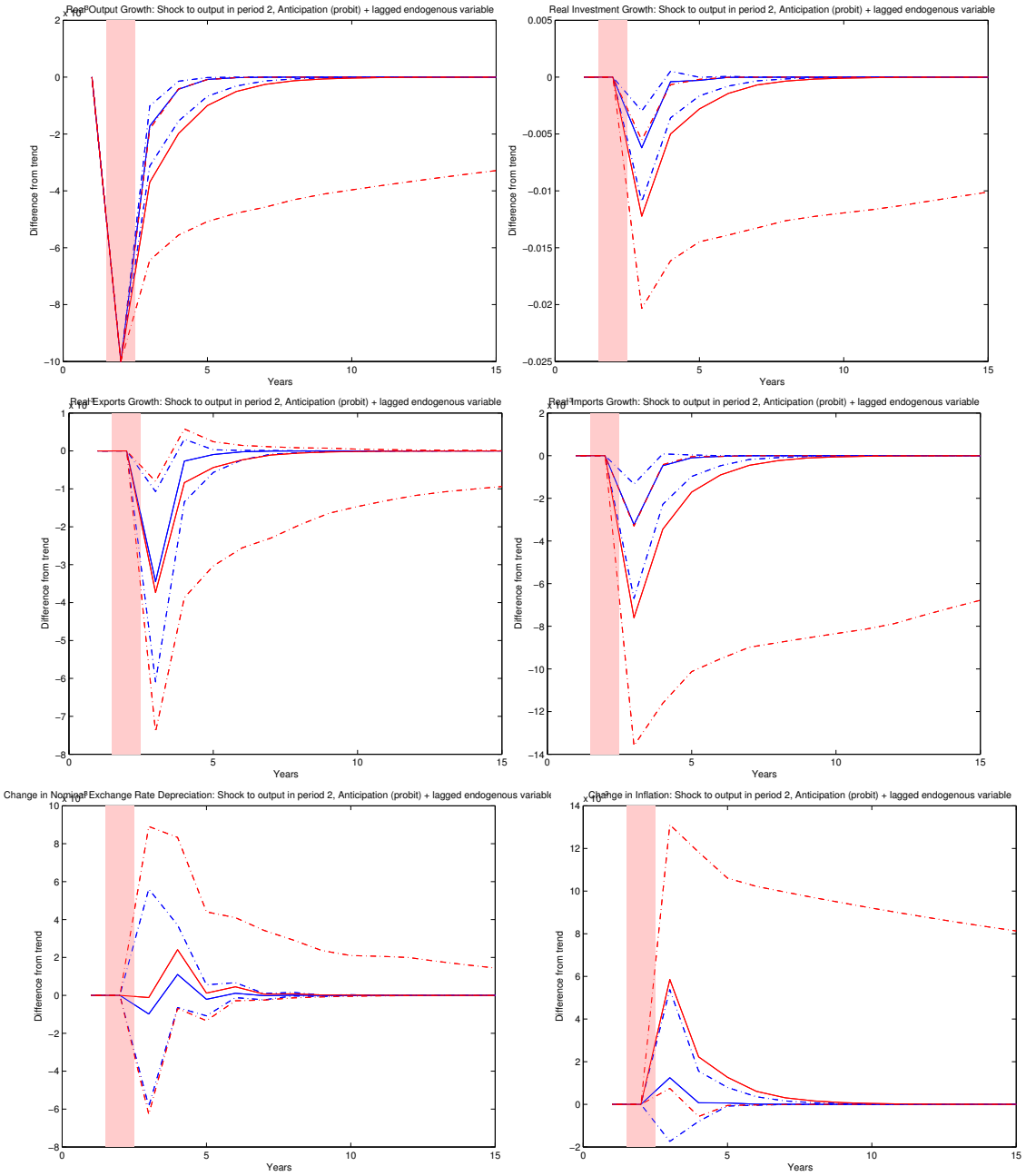

Figure 3: Experiment 2: A shock to output growth via ϵ, comparing responses of countries with high (red) and low (blue) probability of subsequent unrest. Growth rates relative to trend, 95% CI with medians

Unconditional std. dev. of:	Stable country	Revolution-prone country	Ratio
$\Delta Output$	1.02	1.09	1.08
	(1.01,1.05)	(1.02,1.49)	(1.01,1.43)
$\Delta Investment$	1.2	1.69	1.4
	(1.1,1.47)	(1.25,3.25)	(1.09,2.45)
$\Delta Exports$	1.07	1.1	1.01
	(1.01,1.18)	(1.01,1.33)	(0.976,1.16)
$\Delta Imports$	1.05	1.33	1.25
	(1.01,1.2)	(1.04,2.31)	(1.03,1.99)
$\Delta ERdepreciation$	1.18	1.22	1.03
	(1.07,1.38)	(1.08,1.55)	(0.981,1.31)
$\Delta Inflation$	1.02	1.2	1.17
	(1,1.15)	(1.01,2.21)	(1,2.08)

Table 9: Comparing unconditional standard deviations implied by VAR model between stable ($Polity = 10$) and unrest-prone ($Polity = 5$) country for shared process for innovations to endogenous economic series ΔY: $E[\epsilon] = 0$ and $E[\epsilon'\epsilon]$ the identity matrix. Means and ninety-five percent confidence intervals given. The potential for unrest increases propagation of shocks and thereby increases unconditional volatility.

Autocorrelation of:	Stable country	Revolution-prone country	Difference
$\Delta Output$	0.17	0.386	0.215
	(0.102,0.293)	(0.166,0.705)	(0.0447,0.46)
$\Delta Investment$	-0.117	0.2	0.319
	(-0.19,0.0584)	(-0.101,0.76)	(0.0669,0.746)
$\Delta Exports$	-0.0543	-0.021	0.0294
	(-0.11,0.000214)	(-0.0989,0.2)	(-0.00479,0.24)
$\Delta Imports$	-0.0773	0.166	0.24
	(-0.141,0.0198)	(-0.0895,0.672)	(0.0283,0.665)
$\Delta ERdepreciation$	-0.333	-0.291	0.0283
	(-0.509,-0.149)	(-0.482,0.127)	(-0.023,0.394)
$\Delta Inflation$	-0.0622	0.132	0.201
	(-0.182,0.0977)	(-0.0981,0.696)	(0.0284,0.634)

Table 10: Comparing autocorrelations implied by VAR model between stable ($Polity = 10$) and unrest-prone ($Polity = 5$) country for shared process for innovations to endogenous economic series ΔY: $E[\epsilon] = 0$ and $E[\epsilon'\epsilon] =$ the identity matrix. Means and ninety-five percent confidence intervals given. The potential for unrest increases propagation of shocks and thereby increases unconditional volatility.

Table 11: Table of mass political unrests between 1960 and 2006. Source NAVCO 2.0. See text for our definition of revolutions. Note: † denotes that the campaign is on-going as of 2006, when NAVCO 2.0 data ends.

Table 11: Table of mass political unrests between 1960 and 2006. Source NAVCO 2.0. See text for our definition of revolutions. Note: † denotes that the campaign is on-going as of 2006, when NAVCO 2.0 data ends.

	Country	Campaign years	Campaign
1	Algeria	1992-2006	Islamic Salvation Front
2	Angola	1975-2002	UNITA
3	Argentina	1973-1983	Military junta
4	Bangladesh	1987-1990	Bangladesh Anti-Ershad
5	Benin	1989-1990	Anti-communist
6	Bolivia	1977-1982	Anti-Junta
7	Brazil	1984-1985	Diretas ja
8	Bulgaria	1989	Anti-communist
9	Burundi	1972-1973	First Hutu rebellion
10	Burundi	1988	Second Hutu rebellion
11	Burundi	1991-1992	Tutsi Supremacists
12	Burundi	1993-2002	Third Hutu rebellion
13	Cambodia	1979-1997	Second Khmer Rouge
14	Chad	1994-1997	Chad rebels
15	Chile	1983-1989	Anti-Pinochet movement
16	China	1976-1979	Democracy movement
17	China	1989	Tiananmen square
18	Colombia	1964-2006†	FARC
19	Cote d'Ivoire	2002-2005	PMIC
20	Croatia	1999-2000	Croatian institutional reform
21	Djibouti	1991-1994	Afar insurgency
22	Dominican Republic	1965	Dominican leftists
23	Egypt	2000-2005	Kifaya movement against Mubarak
24	Georgia	2003	Rose revolution
25	Ghana	2000	Anti-Rawlings
26	Greece	1973-1974	Anti-military rule
27	Guatemala	1961-1996	Marxist rebels (URNG)
28	Guyana	1990-1992	Anti-Burnham/Hoyte

Continued on next page

Table 11 – continued from previous page

	Country	Campaign years	Campaign
29	Hungary	1989	Pro-democracy movement
30	Indonesia	1997-1998	Anti-Suharto
31	India	1967-1971	Naxalite rebellion
32	Iran	1977-1978	Iranian revolution
33	Iran	1981-1983	Iranian Mujahideen against Khomenei
34	Kenya	1990-1991	Anti-Arap Moi
35	South Korea	1979-1980	Anti-junta movement
36	South Korea	1987	Anti-military movement
37	Liberia	2003	Anti-Doe rebels
38	Madagascar	1991-1993	Active forces (target: Didier Radsiraka)
39	Madagascar	2002-2003	Pro-Democracy movement
40	Malawi	1992-1993	Anti-Banda-regime
41	Mali	1990-1992	Anti-military movement
42	Mexico	1987-2000	Anti-PRI
43	Mexico	2006	Anti-Calderon
44	Mozambique	1979-1992	Renamo
45	Nepal	1990	The Stir
46	Nepal	1996-2006	CPN-M/UPF
47	Nepal	2006	Nepalese anti-government
48	Nicaragua	1978-1979	FSLN
49	Nicaragua	1980-1990	Contras
50	Niger	1991-1992	Anti-military
51	Oman	1969-1976	PFLOAG
52	Pakistan	1968-1969	Anti-Khan
53	Pakistan	1983	Pro-democracy movement
54	Pakistan	1994-1995	Mohajir
55	Panama	1987-1989	Anti Noriega
56	Peru	1980-1995	The Shining Path insurgency
57	Peru	1996-1997	Tupac Amaru revolution
58	Peru	2000	Anti-Fujimori
59	Philippines	1972-2006†	New People's Army
60	Philippines	1983-1986	People Power revolution
61	Portugal	1973-1974	Carnation revolution
62	Rwanda	1990-1994	Tutsi rebels

Continued on next page

Table 11 – continued from previous page

	Country	Campaign years	Campaign
63	Sudan	1983-2006†	SPLA-Garang faction
64	Sudan	2003-2006	JEM/SLA
65	Senegal	2000	Anti-Diouf
66	Sierra Leone	1991-1996	RUF
67	South Africa	1984-1994	Second Defiance campaign
68	Syrian Arab Republic	1980-1982	Muslim brotherhood
69	Sri Lanka	1971	JVP
70	Tanzania	1992-1995	Pro-democracy
71	Thailand	1966-1981	Communist rebels
72	Thailand	1973	Student protests
73	Thailand	1992	Pro-democracy movement
74	Thailand	2005-2006	Anti-Thaskin
75	Tajikistan	1995-1997	Popular Democratic Army (UTO)
76	Uganda	1985-2006†	LRA
77	Ukraine	2001-2004	Orange revolution
78	Uruguay	1963-1972	Tupamaros
79	Uruguay	1984-1985	Anti-military
80	Venezuela	1963	Anti-Jimenez
81	Zambia	1990-1991	Anti-single party
82	Zambia	2001	Anti-Chiluba regime
83	Zimbabwe	1982-1987	PF-ZAPU guerrilla against Mugabe
84	Zimbabwe	1974-1979	Zimbabwe African People's Union

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